

All Regional Engineers

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Special Provision for Surface Testing of Pavements

August 5, 2005

This special provision was developed by the Bureau of Materials & Physical Research as part of the Illinois Smoothness Initiative (ISI). It requires a 0.0 mm (0.00 in.) blanking band be used to calculate the Profile Index values and includes incentives and/or disincentives based on those values.

This special provision has been revised to allow the use of inertial profilers as surface testing equipment in addition to the California Profilograph.

It should be inserted into all interstate contracts, and other non-interstate contracts as selected by the districts. This special provision is not recommended for use on two lane bituminous concrete overlay projects or projects with overlay thicknesses less than 95 mm (3.75 in.).

The districts should include the BDE Check Sheet marked with the applicable special provisions for the November 18, 2005 and subsequent lettings. The Project Development and Implementation Section will include a copy in the contract.

This special provision will be available on the transfer directory August 5, 2005.

80075m

SURFACE TESTING OF PAVEMENTS (BDE)

Effective: April 1, 2002

Revised: November 1, 2005

Bituminous Concrete Overlays

Revise Article 406.03(k) of the Standard Specifications to read:

“(k) Pavement Surface Test Equipment 1101.10”

Revise Article 406.21 of the Standard Specifications to read:

“406.21 Surface Tests. The finished surface of the pavement shall be tested for smoothness within three days of paving. Testing shall be performed in the presence of the Engineer.

Prior to testing, a copy of the approval letter and recorded settings from the Profile Equipment Verification (PEV) Program shall be submitted to the Engineer; and all objects and debris shall be removed from the pavement.

(a) Test Sections/Equipment.

- (1) High-Speed Mainline Pavement. High-speed mainline pavement shall consist of pavements, ramps and loops with a posted speed greater than 75 km/hr (45 mph). These sections shall be tested using a California Profilograph or an approved equivalent.
- (2) Low-Speed Mainline Pavement. Low-speed mainline pavement shall consist of pavements, ramps and loops with a posted speed of 75 km/hr (45 mph) or less. These sections shall be tested using a California Profilograph or an approved equivalent.
- (3) Miscellaneous Pavement. Miscellaneous pavement shall consist of:
 - a. pavement on horizontal curves with a centerline radius of curvature of less than or equal to 300 m (1000 ft) and pavement within the superelevation transition of such curves;
 - b. the first or last 4.5 m (15 ft) of a pavement section where the Contractor is not responsible for the adjoining surface;
 - c. intersections;
 - d. variable width pavements;

- e. side street returns;
- f. crossovers;
- g. connector pavement from mainline pavement expansion joint to the bridge approach pavement;
- h. bridge approach pavement; and
- i. other miscellaneous pavement surfaces (i.e. a turn lane) as determined by the Engineer.

Miscellaneous pavement shall be tested using a 5 m (16 ft) straightedge set to a 10 mm (3/8 in.) tolerance.

(b) Lots/Sublots. Mainline pavement test sections will be divided into lots and sublots.

(1) Lots. A lot will be defined as a continuous strip of pavement 1600 m (1 mile) long and one lane wide. When the length of a continuous strip of pavement is less than 1600 m (1 mile), that pavement will be included in an adjacent lot. Structures will be omitted when measuring pavement length.

(2) Sublots. Lots will be divided into 160 m (0.1 mile) sublots. A partial subplot resulting from an interruption in the pavement will be subject to the same evaluation as a whole subplot.

(c) Testing Procedure. One wheel track shall be tested per lane. Testing shall be performed 1 m (3 ft) from and parallel to the edge of the lane away from traffic. A guide shall be used to maintain the proper distance.

The profile trace generated shall have stationing indicated every 150 m (500 ft) at a minimum. Both ends of the profile trace shall be labeled with the following information: contract number, beginning and ending stationing, which direction is up on the trace, which direction the data was collected, and the device operator name(s). The top portion of the Department supplied form, "Profile Report of Pavement Smoothness" shall be completed and secured around the trace roll.

Although surface testing of intermediate lifts will not be required, they may be performed at the Contractor's option. When this option is chosen, the testing shall be performed and the profile traces shall be generated as described above.

The Engineer may perform his/her own testing at any time for monitoring and comparison purposes.

(d) Trace Reduction and Bump Locating Procedure. All traces shall be reduced. Traces produced by a mechanical recorder shall be reduced using an electronic scanner and

computer software. This software shall calculate the profile index of each subplot in mm/km (in./mile) and indicate any high points (bumps) in excess of 8 mm (0.30 in.) with a line intersecting the profile on the printout. Computerized recorders shall provide the same information.

The profile index of each track, average profile index of each subplot, average profile index of the lot and locations of bumps shall be recorded on the form.

All traces and reports shall be provided within two working days of completing the testing to the Engineer for the project file. Traces from either a computerized profile testing device or analysis software used with a manual profile testing device shall display the settings used for the data reduction. The Engineer will compare these settings with the approved settings from the PEV Program. If the settings do not match, the results will be rejected and the section shall be retested/reanalyzed with the appropriate settings.

The Engineer will use the results of the testing to evaluate paving methods and equipment. If the average profile index of a lot exceeds 635 mm/km (40.0 in./mile) for high-speed mainline pavement or 1025 mm/km (65.0 in./mile) for low-speed mainline pavement, the paving operation will be suspended until corrective action is taken by the Contractor.

- (e) Corrective Work. All bumps in excess of 8 mm (0.30 in.) in a length of 8 m (25 ft) or less shall be corrected. If the bump is greater than 13 mm (0.50 in.), the pavement shall be removed and replaced to the satisfaction of the Engineer at the Contractor's expense. The minimum length of pavement to be removed shall be 900 mm (3 ft).
- (1) High-Speed Mainline Pavement. Any subplot having a profile index within the range of, greater than 475 to 635 mm/km (30.0 to 40.0 in./mile) including bumps, shall be corrected to reduce the profile index to 475 mm/km (30.0 in./mile) or less on each trace. Any subplot having a profile index greater than 635 mm/km (40.0 in./mile) including bumps, shall be corrected to reduce the profile index to 475 mm/km (30.0 in./mile) or less on each trace, or replaced at the Contractor's option.
- (2) Low-Speed Mainline Pavement. Any subplot having a profile index within the range of, greater than 710 to 1025 mm/km (45.0 to 65.0 in./mile) including bumps, shall be corrected to reduce the profile index to 710 mm/km (45.0 in./mile) or less on each trace. Any subplot having a profile index greater than 1025 mm/km (65.0 in./mile) including bumps, shall be corrected to reduce the profile index to 710 mm/km (45.0 in./mile) or less on each trace, or replaced at the Contractor's option.
- (3) Miscellaneous Pavement. Surface variations which exceed the 10 mm (3/8 in.) tolerance will be marked by the Engineer and shall be corrected by the Contractor.

Corrective work shall be completed using either an approved grinding device consisting of multiple saws or by removing and replacing the pavement. Corrective work shall be applied to the full lane width. When completed, the corrected area shall have uniform

texture and appearance, with the beginning and ending of the corrected area squared normal to the centerline of the paved surface.

Upon completion of the corrective work, the surface of the subplot(s) shall be retested. The Contractor shall furnish the profile tracing(s) and the completed form(s) to the Engineer within two working days after corrections are made. If the profile index and/or bumps still do not meet the requirements, additional corrective work shall be performed.

Corrective work shall be at the Contractor's expense.

- (f) Smoothness Assessments. Assessments will be paid to or deducted from the Contractor for each subplot of mainline pavement, per the Smoothness Assessment Schedule. Assessments will be based on the average profile index of each subplot prior to performing any corrective work unless the Contractor has chosen to remove and replace the subplot. For sublots that are replaced, assessments will be based on the profile index determined after replacement.

Assessments will not be paid or deducted until all other contract requirements for the pavement are satisfied. Pavement that is corrected or replaced for reasons other than smoothness, shall be retested as stated herein.

SMOOTHNESS ASSESSMENT SCHEDULE (Bituminous Concrete Overlays)		
High-Speed Mainline Pavement Average Profile Index mm/km (in./mile)	Low-Speed Mainline Pavement Average Profile Index mm/km (in./mile)	Assessment per subplot
95 (6.0) or less	240 (15.0) or less	+\$150.00
>95 (6.0) to 160 (10.0)	>240 (15.0) to 400 (25.0)	+\$80.00
>160 (10.0) to 475 (30.0)	>400 (25.0) to 710 (45.0)	+\$0.00
>475 (30.0) to 635 (40.0)	>710 (45.0) to 1025 (65.0)	+\$0.00
Greater than 635 (40.0)	Greater than 1025 (65.0)	-\$300.00

Smoothness assessments will not be applied to miscellaneous pavement sections.”

Bituminous Concrete Pavement (Full-Depth)

Revise Article 407.09 of the Standard Specifications to read:

“407.09 Surface Tests. The finished surface of the pavement shall be tested for smoothness according to Article 406.21 except as follows:

Two wheel tracks shall be tested per lane. Testing shall be performed 1 m (3 ft) from and parallel to each lane edge.”

SMOOTHNESS ASSESSMENT SCHEDULE (Full-Depth Bituminous)		
High-Speed Mainline Pavement Average Profile Index mm/km (in./mile)	Low-Speed Mainline Pavement Average Profile Index mm/km (in./mile)	Assessment per subplot
95 (6.0) or less		+\$800.00
>95 (6.0) to 175 (11.0)	240 (15.0) or less	+\$550.00
>175 (11.0) to 270 (17.0)	>240 (15.0) to 400 (25.0)	+\$350.00
>270 (17.0) to 475 (30.0)	>400 (25.0) to 710 (45.0)	+\$0.00
>475 (30.0) to 635 (40.0)	>710 (45.0) to 1025 (65.0)	+\$0.00
Greater than 635 (40.0)	Greater than 1025 (65.0)	-\$500.00

Delete the fourth paragraph of Article 407.13 of the Standard Specifications.

Portland Cement Concrete Pavement

Revise Article 420.12 of the Standard Specifications to read:

“420.12 Surface Tests. The finished surface of the pavement shall be tested for smoothness according to Article 406.21 except as follows:

The finished surface of the pavement shall be tested for smoothness once the pavement has attained a flexural strength of 3,800 kPa (550 psi) or a compressive strength of 20,700 kPa (3,000 psi).

Two wheel tracks shall be tested per lane. Testing shall be performed 1 m (3 ft) from and parallel to each lane edge.

Membrane curing damaged during testing shall be repaired as directed by the Engineer at the Contractor's expense.

No further texturing for skid resistance will be required for areas corrected by grinding. Protective coat shall be reapplied to ground areas according to Article 420.21 at the Contractor's expense.

For pavement that is corrected by removal and replacement, the minimum length to be removed shall meet the requirements of either Class A or Class B patching.

SMOOTHNESS ASSESSMENT SCHEDULE (PCC)		
High-Speed Mainline Pavement Average Profile Index mm/km (in./mile)	Low-Speed Mainline Pavement Average Profile Index mm/km (in./mile)	Assessment per subplot
95 (6.0) or less		+\$1200.00
>95 (6.0) to 175 (11.0)	240 (15.0) or less	+\$950.00
>175 (11.0) to 270 (17.0)	>240 (15.0) to 400 (25.0)	+\$600.00
>270 (17.0) to 475 (30.0)	>400 (25.0) to 710 (45.0)	+\$0.00
>475 (30.0) to 635 (40.0)	>710 (45.0) to 1025 (65.0)	+\$0.00
Greater than 635 (40.0)	Greater than 1025 (65.0)	-\$750.00

Delete the sixth paragraph of Article 420.23 of the Standard Specifications.

Testing Equipment

Revise Article 1101.10 of the Standard Specifications to read:

“1101.10 Pavement Surface Test Equipment. Required surface testing and analysis equipment and their jobsite transportation shall be provided by the Contractor.

(a) 5 m (16 ft) Straightedge. The 5 m (16 ft) straightedge shall consist of a metal I-beam mounted between two wheels spaced 5 m (16 ft) between the axles. Scratcher bolts which can be easily and accurately adjusted, shall be set at the 1/4, 1/2, and 3/4 points between the axles. A handle suitable for pushing and guiding shall be attached to the straightedge. The straightedge shall meet the approval of the Engineer.

(b) Profile Testing Device. The Profile Testing Device shall have a decal displayed to indicate it has been tested through the PEV Program administered by the Department.

(1) California Profilograph. The California Profilograph shall be either computerized or manual and have a frame 8 m (25 ft) in length supported upon multiple wheels at either end. The profile shall be recorded from the vertical movement of a wheel attached to the frame at mid point.

The California Profilograph shall be calibrated according to the manufacturer's recommendations and California Test 526. All calibration traces and calculations shall be submitted to the Engineer for the project file.

(2) Inertial Profiler. The inertial profiler shall be either an independent device or a system that can be attached to another vehicle using one or two non-contact sensors to measure the pavement profile. The inertial profiler shall be capable of performing

a simulation of the California Profilograph to provide results in the Profile Index format.

The inertial profiler shall be calibrated according to the manufacturer's recommendations. All calibration traces and calculations shall be submitted to the Engineer for the project file.

- (3) Trace Analysis. The Contractor shall reduce/evaluate these traces using a 0.0 mm (0.00 in.) blanking band and determine a Profile Index in mm/km (in./mile) for each section of finished pavement surface. Traces produced using a computerized profile testing device will be evaluated without further reduction. When using a manual profile testing device, the Contractor shall provide an electronic scanner, a computer, and software to reduce the trace. All analysis equipment (electronic scanner, computerized recorder, etc.) shall be able to accept 0.0 mm (0.00 in.) for the blanking band.

All traces from pavement sections tested with the profile testing device shall be recorded on paper with scales of 300:1 longitudinally and 1:1 vertically. Equipment and software settings of the profile testing device and analysis equipment shall be set to those values approved through the PEV Program.

The Engineer may retest the pavement at any time to verify the accuracy of the equipment."